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(54) Fire retardent fabrics

(57) A fire retardent fabric is made by selecting from known fire retardent fibres a mixture of fibres, making at least two fabric components from different combinations of said fibres, assigning said selected fibres to said components and assembling said components into a fabric having improved fire retardent properties as compared with a fabric made from a single fabric component comprising all said selected fibres. Fabrics comprising a mixture of three different fibres each of which is slected from the group consisting of aramid fibre, modacrylic fibre, fire retardent polyester fibre and fire retardent viscose fibre are described and may be knitted, woven or non-woven.

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SPECIFICATION

Fire retardant fabrics

This invention relates to fire retardant fabrics.

Textile fibres have been produced which have useful fire retardant properties. Among such fibres are aramid fibres, such as Nomex (RTM), modacrylic fibre, fire retardant polyester fibres, and fire retardant viscose fibres, which are fire retardant because of properties inherent in the polymer of which they are comprised or by virtue of additives to the melt or solution from which they are spun.

The available fire retardant fibres have different fire retardant characteristics and also differ in other properties such as wear resistance, strength, handle and dimensional stability. Fire retardant fabric components – which by and large are yarns for weaving and knitting – can be made from blends or mixtures of fibres. The selection of fibres to make up a blend is based on a number of factors and is usually a compromise between performance and cost. The high cost of a pure aramid yarn can be reduced considerably by blending the aramid fibres with fire retardant viscose fibres, for example without too much loss of wear resistance and with little reduction in fire retardant performance.

The present invention is concerned with fabrics made from mixtures of fibres and provides specifically improved fibre mixtures as well as improved ways of using such mixtures to make fabrics.

The invention comprises a fire retardant fabric comprising a mixture of three different fibres each of which is selected from a different one of the group consisting of aramid fibre, modacrylic fibre, fire retardant polyester fibre and fire retardant viscose fibre.

It is noted that while all such fabrics will possess at least the fire retardant properties that would be expected of the mixture of fibres, at least some fabrics can have fire retardant properties enhanced even over those of any of the individual fibres. Clearly some synergism operates. However, the manner of its operation is not apparently straightforward.

It is found that a fabric which is fabricated from two different yarns, each of which comprises fibres from at most two of said group, can have substantially improved properties as compared to such a fabric made from a single yarn comprising all the fibres in the same proportions by weight as the two different yarns taken together.

Such a fabric can be fabricated from two different yarns each of which comprise aramid fibre, especially yarns comprising at least 50% by weight of aramid fibre. Such a fabric comprising a first yarn consisting of 65% aramid fibre and 35% fire resistant viscose fibre and a yarn consisting of 50% aramid fibre and 50% modacrylic fibre has especially interesting fire retardant properties in that it is suitable for use in hyperbaric conditions, especially in oxygen-helium atmospheres.

The two yarns can be used as warp and weft for a woven fabric, or can be knitted either on weft or warp knitting machines. In any event, the construction of the fabric can be such as distributes the fibres effectively having regard to other required properties of the fabric. Thus, for example, aramid fibres of high durability can be plated on one side of the fabric which in use will be subject to wear, while modacrylic or fire retardant polyester fibres can be arranged to be predominant on the other side.

In a non-woven fabric, for example a needlefelt or stitch bonded fabric made from a mixture of fibres according to the invention, the fibres can likewise be distributed differentially in the fabric both to enhance the fire retardant properties of the fabric by having on one face a mixture having a preponderance of a certain two fibres and on the other face a different mixture.

The invention comprises, in another aspect, a method for making a fire retardant fabric comprising selecting at least three fibres from the group consisting of aramid fibre, modacrylic fibre, fire retardant polyester fibre and fire retardant viscose fibre, making at least two fabric components from different combinations of said fibres, assigning said selected fibres to said components and assembling said components into a fabric having improved fire retardant properties as compared with a fabric made from a single fabric component comprising all said selected fibres.

Said fabric components may comprise yarns from which woven, or knitted fabrics may be fabricated, or fleeces from which non-wovens can be made.

The invention also comprises a method for making a fire retardant fabric comprising selecting from known fire retardant fibres a mixture of fibres, making at least two fabric components from different combinations of said fibres, assigning said selected fibres to said components and assembling said components into a fabric having improved fire retardant properties as compared with a fabric made from a single fabric component comprising all said selected fibres.

In effect, therefore, the invention provides a method for optimising the fire retardant properties of a given blend or mixture of fibres, which itself might be selected as a compromise, for example, between cost and dimensional stability, by adjusting the distribution of the fibres between different fabric components, within any constraints imposed by reference to other desired properties such as wear resistance, comfort or sewability.

For instance, wear resistance may require a preponderance of aramid on one face of the fabric, while comfort may require a preponderance of modacrylic fibre. Sewability may require that the fabric be woven rather than knitted, especially for heavier or denser fabrics, which permits warp and weft components to be different and a weave to be chosen to expose the warp and weft differentially in opposite faces of the fabric.

Clearly, the discovery that different distributions of fibres between different fabric components yarns or fleece, for example can lead to improved fire retardant properties as compared to making the fabric from a single component in which the

fibres are intimately mixed or blended, can lead to improved fire retardant fabrics by trial and error methods in accordance with the invention.

Fire retardant fabrics according to the invention will now be described in the following Examples.

Example I

An aramid fibre is blended with an FR viscose fibre in the proportions 65:35 by weight, both fibres being of 2 denier and 51 mm staple. A first yarn is spun from the blended fibre to have a resultant yarn count of 40's English Cotton Count. This yarn is then folded to give a resultant yarn count of 2/40's English Cotton Count.

An aramid fibre is blended with a modified acrylic fibre in the proportion 50:50 by weight, both fibres being of 2 denier and 51 mm staple. A second yarn is spun from the blended fibre giving a resultant yarn count of 24's English Cotton Count.

A fabric is woven in a 2 and 1 gaberdine construction having a warp of 38 ends/cm of the first yarn and 25 picks/cm of the second yarn.

The fabric, after scouring and heat setting, has, unusually good fire retardent properties especially under hyperbaric conditions in an oxygen/helium atmosphere.

Example II

A fabric is made like that of Example I but in which the second yarn is of a blend of 50% aramid and 50% FR polyester. The fabric has good fire retardent properties.

Example III

A fabric is made after the fashion of Example I except that in the first yarn the aramid fibre is replaced with modacrylic fibre of the same denier and staple length, and the second yarn is of 65% modacrylic fibre and 35% FR polyester fibre.

The fabric has good fire retardent properties while being less expensive than the fabric of Example I.

Example IV

A fabric is made using as warp the first yarn of Example I and as weft the modacrylic/polyester yarn of Example III. The fabric has good fire retardent properties.

CLAIMS

1. A fire retardent fabric comprising a mixture of three different fibres each of which is selected from a different one of the group consisting of aramid fibre, modacrylic fibre, fire retardent polyester fibre and fire retardent viscose fibre.

2. A fabric according to claim 1, which is fabricated from two different yarns each of which comprises fibres from at most two of said group.

3. A fabric according to claim 1 or claim 2, which is fabricated from two different yarns each of which comprises aramid fibre.

4. A fabric according to any one of claims 1 to 4, comprising at least 50% by weight of aramid fibre.

5. A fabric according to any one of claims 1 to 4, in which each yarn comprises at least 50% by weight of aramid fibre.

6. A fabric according to any one of claims 1 to 5, comprising a first yarn consisting of aramid and fire retardent viscose fibre and a second yarn comprising aramid and modacrylic fibre.

7. A fabric according to claim 6, in which said first yarn comprises 65% by weight aramid fibre.

8. A fabric according to claim 6 or claim 7, in which said second yarn comprises 50% by weight aramid fibre.

9. A fabric according to any one of claims 1 to 8, in which no one of said fibres is present in an amount less than 15% by weight.

10. A fabric according to any one of claims 1 to 9 being a woven fabric comprising warp and weft yarns, said warp and weft yarns being different.

11. A fabric according to any one of claims 1 to 9, being a knitted fabric made from two different yarns.

12. A fabric according to claim 11, being a weft knitted fabric, having a yarn comprising a substantial proportion of aramid fibre plated on one surface.

13. A fabric according to any one of claims 1 to 9, comprising a non-woven fabric.

14. A fabric substantially as hereinbefore described.

15. A method for making a fire retardent fabric comprising selecting at least three fibres from the group consisting of aramid fibre, modacrylic fibre, fire retardent polyester fibre and fire retardent viscose fibre making at least two fabric components from different combinations of said fibres, assigning said selected fibres to said components and assembling said components into a fabric having improved fire retardent properties as compared with a fabric made from a single fabric component comprising all said selected fibres.

16. A method for making a fire retardent fabric comprising selecting from known fire retardent fibres a mixture of fibres, making at least two fabric components from different combinations of said fibres, assigning said selected fibres to said components and assembling said components into a fabric having improved fire retardent properties as compared with a fabric made from a single fabric component comprising all said selected fibres.

17. A fabric according to any one of Examples I to IV.

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